

DOCUMENT RESUME

ED 276 234

EC 191 352

AUTHOR Ball, Stanley
TITLE Similarities in Cognitive Development of Severely Physically Handicapped and Younger Regular Students.
PUB DATE 86
NOTE 9p.; In: Murphy, Harry J., Ed.; Dunnigan, J. A., Ed. Computer Technology and Persons with Disabilities: Proceedings of the Conference (Northridge, California, October 17-19, 1985); see EC 191 351.
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Development; *Computer Assisted Instruction; Developmental Stages; Elementary Secondary Education; Learning Processes; *Microcomputers; *Physical Disabilities
IDENTIFIERS *LOGO Programming Language

ABSTRACT

The paper presents a description of and a rationale for a single-stroke LOGO package for physically handicapped students. The package is intended to promote cognitive decision making via a simplified single-stroke keyboard approach. Sequential behaviors of nonhandicapped students learning to use the system are described. Physically handicapped students, while slower, proceed through the sequence in a fashion similar to nonhandicapped peers. For these students, computer interaction may promote cognitive development not possible with any other media. (CL)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED276234

EC191352

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ☒ This document has been reproduced as received from the person or organization originating it.
- ☐ Minor changes have been made to improve reproduction quality.
- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Similarities In Cognitive Development Of Severely
Physically Handicapped And Younger Regular Students

Stanley Ball
The University of Texas at El Paso
El Paso, TX

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

Harry J. Murphy

2

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

Introduction

Recent research with the use of a carefully produced single-stroke Logo package by the author presented a cognitive hierarchy of development for students in grades K-3 (Ball, 1985). Because of potential differences in perception and psychomotor experiences which relate to directionality, length, and orientation, it is of interest to investigate the progress of physically handicapped students through these cognitive "benchmarks." This paper presents a brief description of and a rationale for the single-stroke Logo package developed for this investigation and some initial comparative results.

A Vehicle for Problem-Solving Development

Many potential uses of computers with the physically handicapped exist. The emphasis of this paper will be on logic/problem-solving development for students with communication problems which are due to physical impairment. The specific Logo package designed for this work unlocks an interactive world for these students which promotes cognitive decision-making.

Because of these students' difficulty with excessive keyboarding, it is desirable to use single-stroke activities with the computer. Also, Logo is used because of the graphic feedback provided the students. A sequence of shapes is presented (via the alphabet) which the students replicate using an increasingly sophisticated set of single-stroke Logo type commands. Selected shapes are shown in order of increasing difficulty in Figure 1. There are four levels and 104 shapes in all.

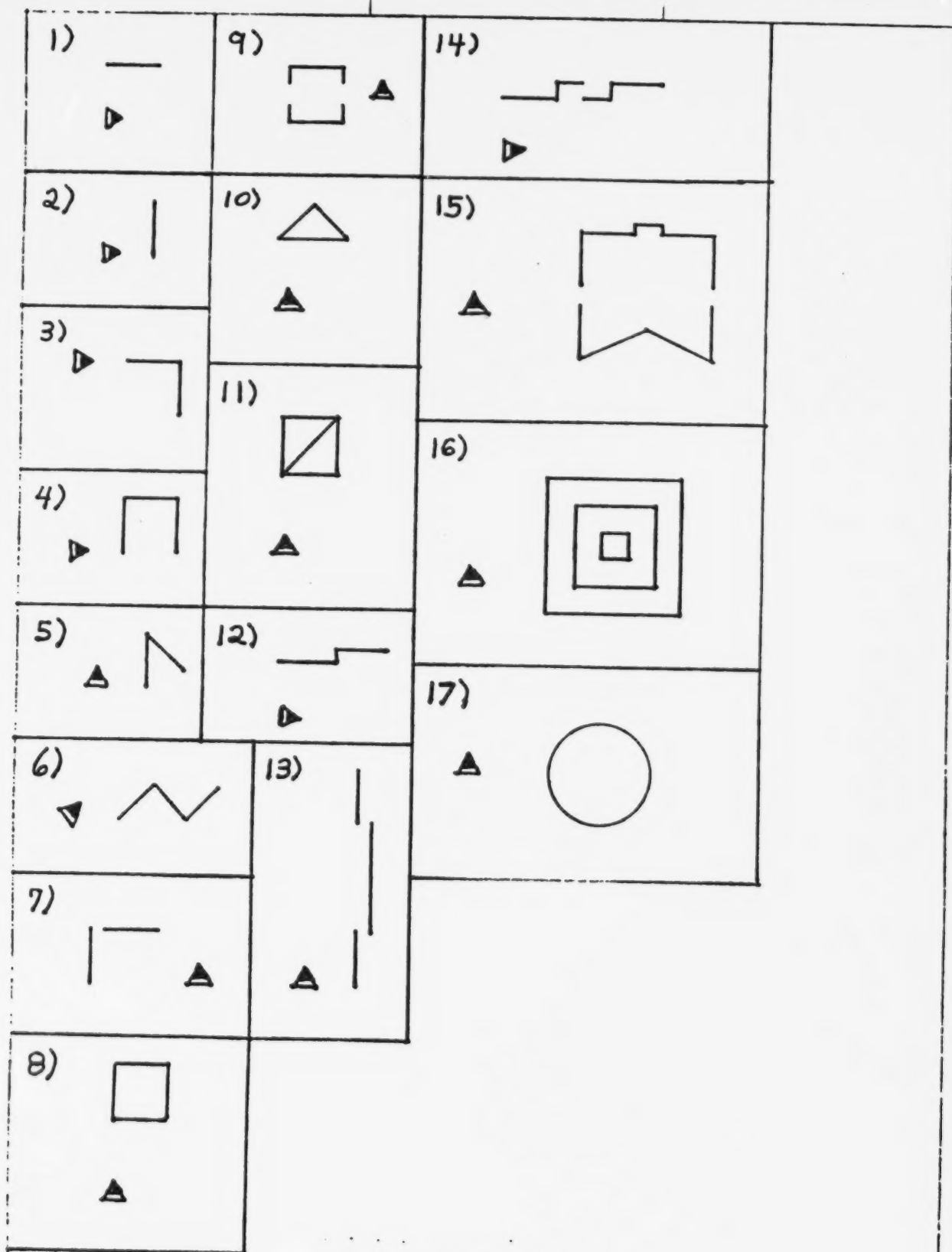


Figure 1

Students generally work alone at the computer with minimum supervision from a supervisor or teacher. The design for this sequence of problems (shapes) is to have students solve each one using strategies acquired by having succeeded with previous problems. The interactive nature of the computer provides reinforcement to the students so that they can "own" their solutions. Once the initial process of how the shapes are called and instructions are understood, students proceed through the shapes with little attention from any other person. No outside evaluation of students' work is necessary for the students to gain a sense of their success or failure. They are responsible for their own progress, as they develop decision-making strategies through experimentation.

Developmental Benchmarks

Previous research (Ball, 1985) has demonstrated a fairly consistent pattern of evolving sophistication on the part of young people as they proceed through the patterns. The nine benchmarks reported are:

- 1) students demonstrating simple control over the turtle rather than merely viewing the random motion of the turtle as they press keys,
- 2) students making primitive decisions about the direction the turtle is facing,
- 3) students making primitive decisions concerning the length of lines,
- 4) students utilizing the turtle's orientation as an aid to length correction
- 5) students demonstrating plan ahead strategies when they realize

an error,

- 6) students demonstrating length correction during subsequent trials,
- 7) students eclectically using the different turn keys,
- 8) students deciding which turn to use before either key is touched,
- 9) students paying explicit attention to the relative orientation of the shape.

Initial observations indicate that these sequential behaviors are fairly common to students in the early grades who have not had extensive previous experience with a computer.

Different Experiences for the Physically Handicapped

It is well known that physically handicapped (PH) people have not had the same benefits of psychomotor experiences which lead to perceptions and decision-making as others have. This would seem to be particularly true of the kinds of decisions necessary for the tasks presented here with Logo graphics. Length, direction, and orientation are all very much part of one's perspective and sense of self within the environment. Seymour Papert, in his important book, entitled *Mindstorms*, refers to "body syntonicity" as the relationship between Turtle geometry and students' knowledge of their bodies in space.

The trial-and-error learning accompanying crawling, walking, reaching, and turning all impinge on future interaction between individuals and their environment. The PH person is deprived of these experiences. Therefore, it becomes necessary to see if the PH student can interact with computer promoted graphic problems and can benefit

from these interactions. How much does a student's moving in space have to do with their ability to progress through these patterns?

It is known that regular education students learn while they are away from the computer. On a given day, these students may not discriminate quite as well as one would like. However, without any external evaluation, these same students may return to the computer at a later date and demonstrate discrimination which is much keener as well as a desire for their task to be "more right." There is the question of whether students' movement about the world around them brings about this integration in a way which would not be possible for PH students.

Initial Observations

Within the obvious constraints of physically working slower, the PH students are able to provide the mental decision-making necessary to progress through the sequence of shapes much as regular education students do. Particular attention was paid to the evidence of discrimination of length and direction. PH students seem to relate the key-strokes and turtle action quite immediately. Exceptions to this general overall similarity between regular education students and the PH occur when the physical handicapping condition is accompanied by other brain related dysfunctions. This paper addresses only those PH students whose vision allows interaction with a monitor screen, whose emotional interaction is conducive to sitting at the computer without trauma, and whose communication skills are sufficiently well developed to understand the instructions.

There seem to be the same differences in personality evident. Some students will use the turn keys eclectically different from other

students. Some students work more slowly, more exacting, or more in need of external reinforcement than others. There seems to be no evidence that PH students are responding to computer feedback any differently than regular education students.

Also, the PH students seem to progress through the same stages of experimentation with the length and direction. When today, the shapes did not quite match, tomorrow they will be the same. It is exciting to watch students make the decisions necessary to complete shapes they were unable to complete initially. Since these activities are presented without any evaluation on the part of any other person present, the students' success is totally dependent on their own strategy development.

Even though observation has been quite limited so far, there is reason to believe that PH students can benefit from activities such as these with single-stroke Logo. There have been instances of students with sufficiently severe physical handicaps to inhibit their getting feedback for their own decision-making in a timely fashion for correction with their other classroom materials. These students are deprived of an internally recognized sense of growth, until they have access to a computer. Then their delight is observable. Sometimes, this is the first time these students have had this successful experience.

What Kind of Learning is Taking Place?

Streibel (1983), in his discussion of the educational utility of computers, specifically asked about the learning potential of Logo. Many of these PH students can, in fact, constructively interact with the computer on tasks requiring length, direction, and orientation

without having had the physical body-in-space experiences. Therefore, it seems that this computer interaction promotes a kind of cognitive development different from that resulting from a transfer of "body syntonicity."

There is increasing interest in the idea that interaction with a computer can, if the activities are carefully constructed, promote cognitive development which is not possible with any other media. This idea receives support from the work which is presented here. One possible explanation or description of what is taking place comes from Dickson (1985) who is studying the juxtaposition of symbol systems. This paper is not the place to pursue this concept with any depth. However, the question has some relevance to the kinds of tasks we present to PH students. They are in need of the ability to use efficient symbols to successfully interact and communicate with the world around them. Classroom computer activities such as reported here seem to have value in one form or symbol usage which is available to these students.

References

- Ball, S. (1985). Programming benchmarks for the young student. School Science and Mathematics, 85, 374-382.
- Dickson, W.P. (May 1985). Thought-provoking software: juxtaposing symbol systems. Educational Researcher, 30-38.
- Papert, S. (1980). Mindstorms. New York: Basic Books, Inc.
- Streibel, M. (1983). The educational utility of logo. School Science and Mathematics, 83, 474-484.

#